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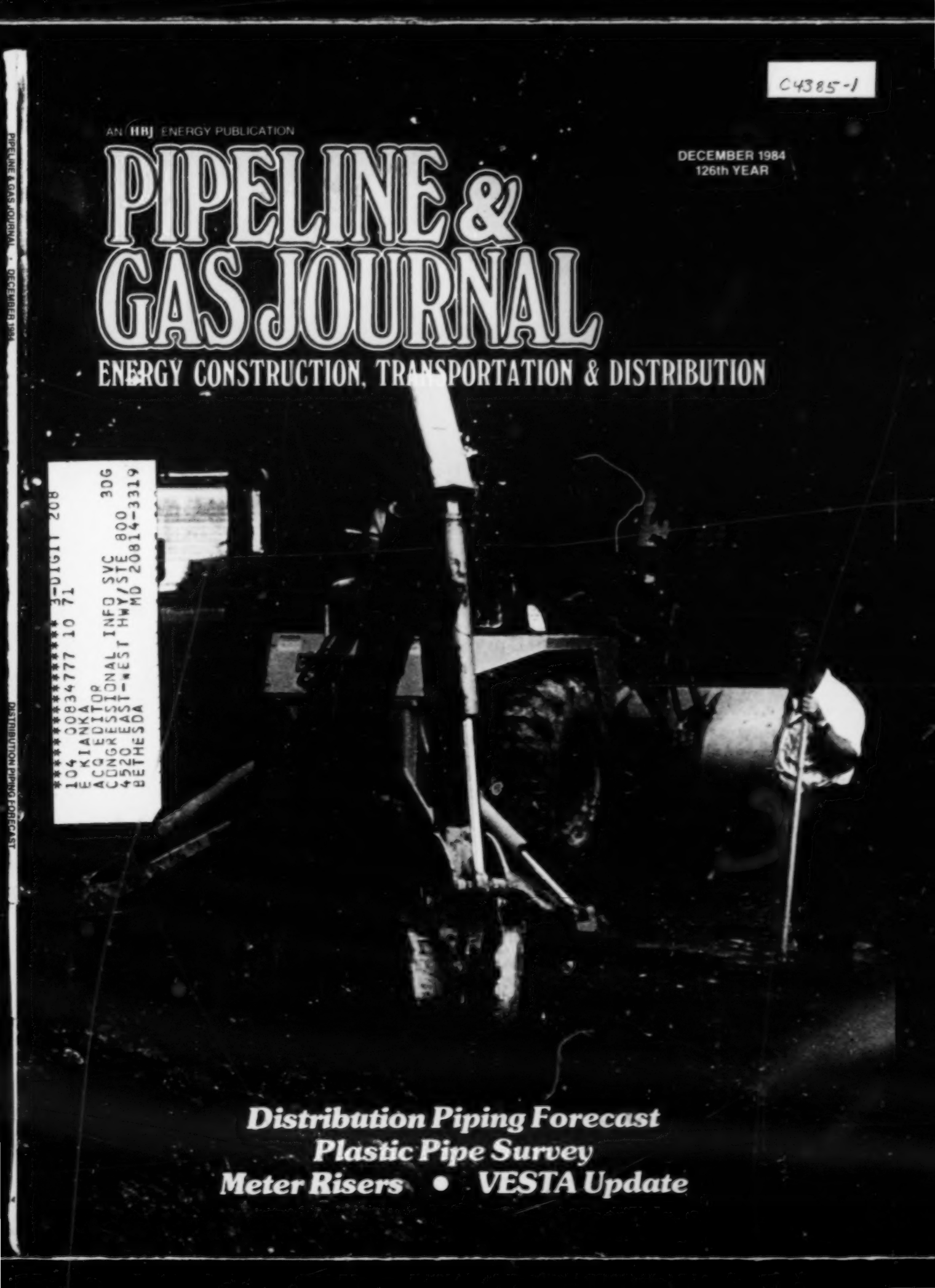
PIPELINE & GAS JOURNAL

DECEMBER 1984
126th YEAR

ENERGY CONSTRUCTION, TRANSPORTATION & DISTRIBUTION



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ACQ EDITOR
CONGR'ESSIONAL INFO SVC 3DG
4520 EAST-WEST HWY/STE 800
BETHESDA MD 20814-3319

Distribution Piping Forecast
Plastic Pipe Survey
Meter Risers • VESTA Update

PIPELINE & GAS JOURNAL • DECEMBER 1984
DISTRIBUTION PIPING FORECAST

PIPELINE & GAS JOURNAL

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International Pipeline & Gas Utility Design, Construction & Operation

ON THE COVER

Union Gas crews install a replacement gas main in Ontario. Repair, replacement, and renovation are taking an increasingly larger share of the gas distribution capital budget – in 1985, U.S. gas utilities expect to spend almost $3.5 billion for new and replacement mains and services, and maintenance of the existing system. Almost half the total amount budgeted is earmarked for maintenance and repair of the installed network.

IN THIS ISSUE

PE pipe is the material of choice for most U.S. gas distributors, accounting for slightly more than 82% of all the gas distribution piping installed during 1984. High usage level will continue through 1985, with more than 78% of the pipe expected to be plastic. Respondents to the annual P&GJ Plastic Piping Survey say they prefer plastic pipe for its durability, longevity, and ease of installation.

NEXT MONTH

1985 looks to be a busy year for U.S. and Canadian pipeliners, with several major projects scheduled to get underway this year. P&GJ's annual U.S. and Canadian construction outlook provides details on the major projects, as well as the numerous smaller jobs, involved in bringing energy to market.

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The non-corrodible meter riser, used by 95% of all U.S. gas utilities, is a phenomenon that owes its existence to the PE service line. There is a design to fit every need.

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Advanced gas distribution system under development at the Institute of Gas Technology can be implemented with existing technologies.

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Excavation device will loosen and remove soil in a single operation without damaging pipe despite digging close to, around, and even beneath utility lines.

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Distribution Expenditures To Top $3.4 Billion In 1985

Distribution Piping Forecast

SPECIAL REPORT

by Jim Watts,
Assistant Editor

U.S. gas utilities now spend almost as much money repairing and maintaining their distribution network as they do in adding new and replacement pipe to the system. Results from 350 gas utilities surveyed in the 19th annual PIPELINE & GAS JOURNAL Distribution Piping Survey show maintenance expenditures trailing new and replacement construction costs by only a small margin.

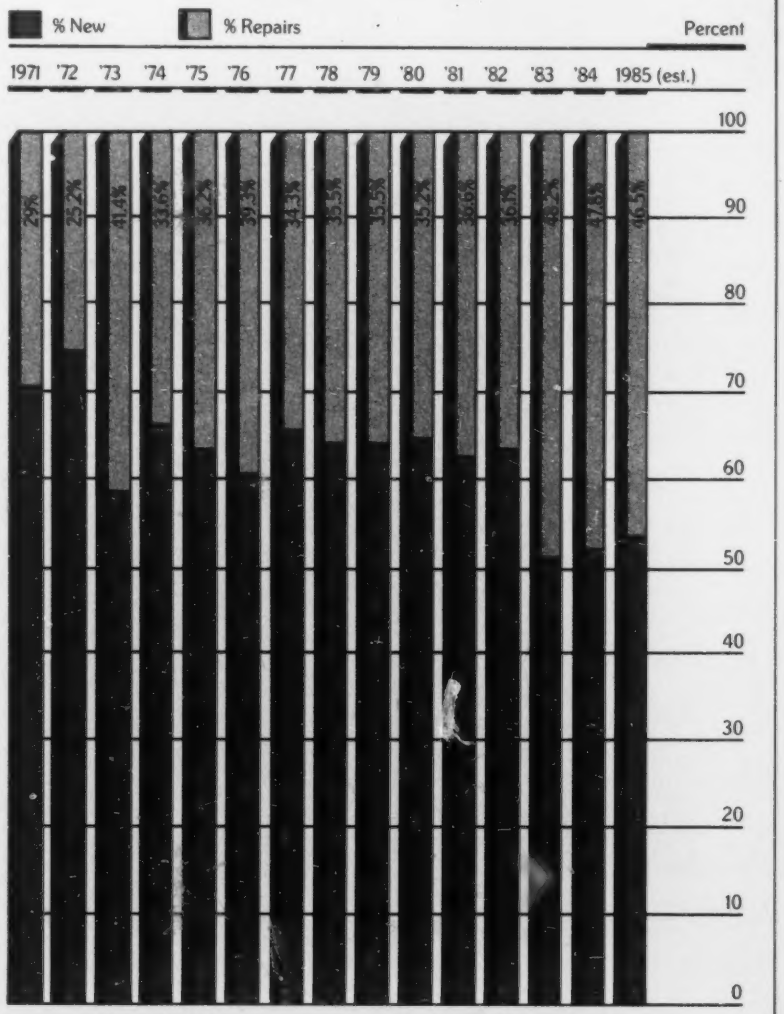
An estimated $3,259,127,000 was spent in 1984 to upgrade, expand, extend, repair, replace, and maintain the U.S. gas distribution network. Of the total, $1,699,078,000 was spent on new and replacement mains and services, with $1,560,048,000 going for system maintenance. In the 1983 piping survey, utilities said they expected to spend $3.76 billion on their systems in 1984.

Respondents said they expect to spend $3,484,175,000 to repair, replace, rehabilitate, and expand their distribution piping system in 1985. Installation of new and replacement mains and services will total $1.862 billion with maintenance and repairs budgeted at $1.621 billion.

Systems are aging. Many vice presidents and superintendents of the utilities surveyed said their biggest problem is keeping aging systems operating safely and efficiently at a time when gas sales, and therefore company revenues, are slumping. The fact that the industry is installing as much pipe for less money than in the past is evidence that cost-cutting practices are beginning to pay off. Mentioned prominently in the list of reasons for this are increased reliance on plastic pipe, use of contractors to keep company payrolls down, lower interest rates, lower inflation, inserting plastic liners into deteriorated mains and services rather than rebuilding them, and improved construction machines and techniques.

Mileage tops 25,000. More than 25,000 miles of pipe were added to the U.S. gas distribution network–12,196 miles of mains and 13,178 miles of services. With the 1984 additions, the nation's gas distribution piping totals 1,428,777 miles, including 866,137 miles of mains and 562,640 miles of services. Respondents said they expect to install 12,547 miles of mains and 14,231 miles of services in 1985.

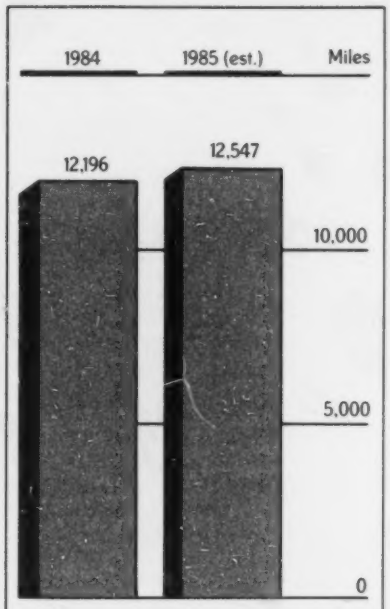
Construction And System Maintenance As Components Of The Capital Budget



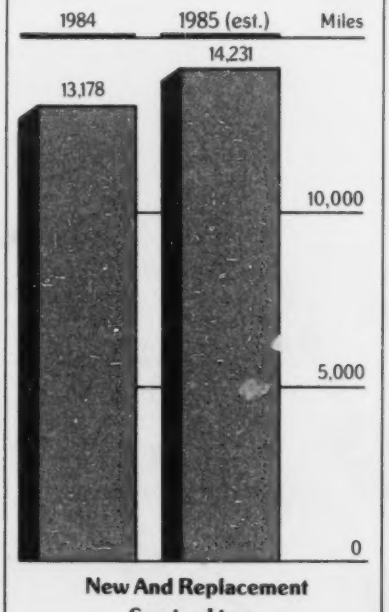
As first noted in the 1983 survey, maintenance and repair of the existing system accounts for almost half of the 1985 construction budget. Maintenance and repair, which was only 36.1% of the total construction budget as recently as 1982, was 47.8% of the budget in 1984 and is expected to be 46.5% of the total construction budget in 1985.

Slightly more than 600,000 customers were added by gas utilities in 1984, up from an estimated 574,000 in 1983. Utilities said they have benefited from more aggressive marketing of gas energy, increased residential construction, and stable gas rates. Total includes 527,000 new customers attributed to new construction; 72,800 conversions from other sources to gas; and 11,000 new commercial and industrial customers.

Older systems. Although plastic pipe is very popular with gas utilities and



New and Replacement Mains



New And Replacement Service Lines

Equipment, Personnel: You Get What You Pay For

Two of the most expensive items in any construction budget are equipment and personnel. It is false economy to scrimp on either expense.

A machine might seem very expensive to the accounting department, but if it can do several jobs, and do them more efficiently than machines designed for one specific task, it can pay for itself very quickly and become very important to the construction superintendent. A cheap installation job may ultimately cost many times what it would cost to have the project done right the first time by a skilled, competent crew.

Keeping highly skilled, well-paid construction workers on the gas company payroll is becoming less and less attractive to many utilities. Instead of paying salaries and benefits to a large work force that is idle much of the year, many companies are contracting out much of their new construction work. This allows a reduced work force to concentrate on routine maintenance and emergency leak situations, while maintaining a high level of competence on construction projects.

However, the trend is not universal. Several respondents from smaller gas utilities said they prefer to have all their work done by company crews. Other small utilities said they could not afford to do that and contracted almost all work to outside forces.

Below are some responses to the question about reliance on contractors:

"We find it is cheaper to hire a contractor for most projects."

"Almost all of our construction work is contracted out. We occasionally will hire a contractor's men and equipment for leak repairing and main lowering."

"We have increased the amount of work contracted because company personnel would have to be laid off when special projects are completed."

"All main and service installation work is contracted."

"We contract for about 90% of our work."

"Our forces have been unable to keep up with an expansion program. We have had to rely on contractors."

"We reduced our work force to reduce our overhead, and that means work at peak times has to be contracted."

"We find we get lower costs when we use contractors instead of company crews for new construction."

"We have increased contractor reliance due to the seasonal nature of the work."

We asked gas utility executives across the country if they operated under a one-call system, and if the system was worth the time, effort, and money it required. Here are their answers.

"Since we began a one-call system our dig-ins have been reduced by about 50%."

"We're trying to start one in our area, but no one else seems to be very interested."

"We have not noticed a reduction in damages but we have noted an increase in excavation notification."

accounts for a large majority of new pipe going into the ground every year, many utilities still have extensive cast iron and steel pipe systems. To find out how well these systems are holding up, executives of the 350 gas utilities were asked, "Do you have a replacement schedule for cast iron and steel mains and services? What is it?" Here is a sample of the responses:

"We have eliminated all cast iron mains and services."

"As streets are reconstructed, cast iron mains are replaced. Steel mains are replaced if they are leaking due to corrosion or are undersized."

"Each section of cast iron is reviewed and analyzed for replacement or rehabilitation, as necessary, determined by leak surveys and service requirements."

"We have only 2 miles of cast iron mains left in our system, and they are being inserted with plastic lines by our own personnel."

"We have a replacement schedule for cast iron mains installed prior to 1930 of about 35 miles per year. Steel service lines are upgraded when new main is installed or in conjunction with street resurfacing."

"We replace a minimum of 35,000 ft of cast iron mains every year."

"We are 4 years into a 20-year cast iron replacement program. We have the same plan for bare steel that is not cathodically protected."

"We will replace all our cast iron and bare steel within 5 years." **P&GJ**

Utilities Finding New Applications For Plastic Pipe

SPECIAL REPORT

by Jim Watts,
Assistant Editor

Plastic pipe has become a multipurpose piping material. More and more gas utilities say they find it to be a cost-effective way to keep old mains and services operating far beyond their normal life span.

Inserting polyethylene liners into corroded, leaking cast iron and steel mains and services is the second most common application for plastic pipe, after direct burial construction of new mains and services. Trailing far behind are plastic lines for backyard grills, swimming pool heaters, and drip lines.

Use tops 82%. U.S. gas utilities installed a total of 25,237 miles of mains and services in 1984. Slightly more than 82%, or 20,707 miles, were plastic. An estimated 21,002 miles of the 26,778 miles, or 78.4%, of distribution piping expected to be installed in 1985 will be plastic.

Service life. Not only is plastic easy to work with, store, and transport, it is virtually indestructible. So far, no one really knows how long PE pipe will last in the ground — the systems simply are not old enough. Assuming the resin is correctly formulated, the pipe is kept out of direct sunlight for long periods prior to installation (ultraviolet rays from the sun are one of the few known enemies of plastic pipe), the joints are correctly fused, and outside forces do not dig into the pipe, it apparently will last almost forever.

By the time PE pipe has been in the ground as long as some of the cast iron and steel lines have been, some problems may occur. But as far as the respondents to the survey are concerned, it is a matter of just "plant it and forget about it."

The 350 gas utility executives polled in our 1984 survey were asked, "Have you found it necessary to replace any plastic mains and services? Why?"

"Only for size increases."

"At times we have had to replace older PVC mains due to leakage at coupling, or due to pipe's brittle nature."

"Only due to third-party damage."

"Occasionally due to outside forces."

"Very few, due to damage by outside forces."

"Lightning damage to PVC and failure of Tenite (ABS) plastic in service."

"We have had to replace ABS fittings with steel due to inability to locate ABS fittings."

"Yes, due to poor installation techniques."

"Due to inferior installation during initial use of plastic, we found it necessary to replace some plastic mains and services."

"Not yet."

"Yes, we have found that PE 3306 tend to split or break too easily."

"No, other than isolated leaks due to various causes."

"Yes, one section of approximately 1,000 ft of 4-in. installed in 1972 has had several failures due to longitudinal breaks."

Easy installation. We asked each company what percentage of new mains and services they installed in 1984 were plastic, and if the widespread increased use of plastic has led to changes in personnel and inventory requirements. Here is a sampling of their answers.

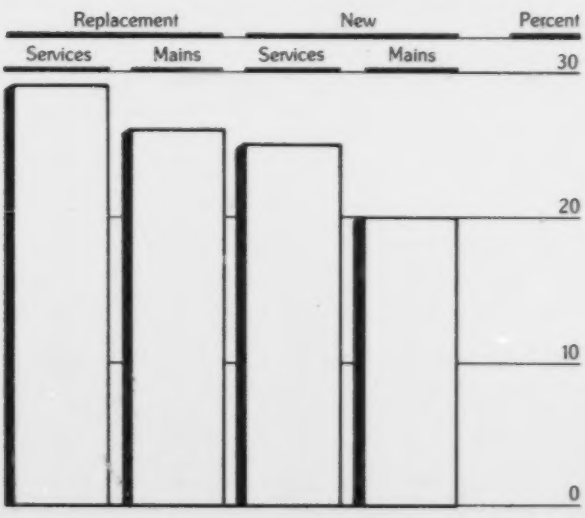
"About 40% of our mains and 60% of our services are plastic. We use more plastic than before because it is easier to handle, to install, and to maintain. This has required changes in labor qualification, new installation techniques, and more storage for materials."

"All our distribution piping has been plastic for 20 years."

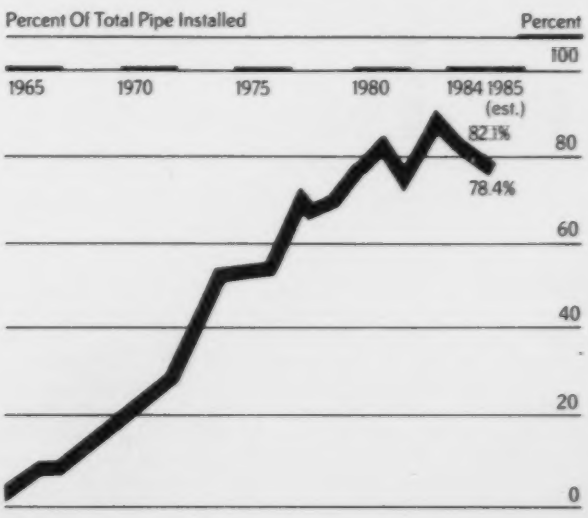
"About 85% of our mains and 95% of our services installed are plastic. The personnel have already been trained."

"We are using more plastic in an attempt to lower costs due to electric competition. Approximately 50% of the mains and 80% of the services installed in 1984 were plastic." **P&GJ**

Where Gas Utilities Use Plastic Pipe



Plastic Pipe Used In Gas Distribution



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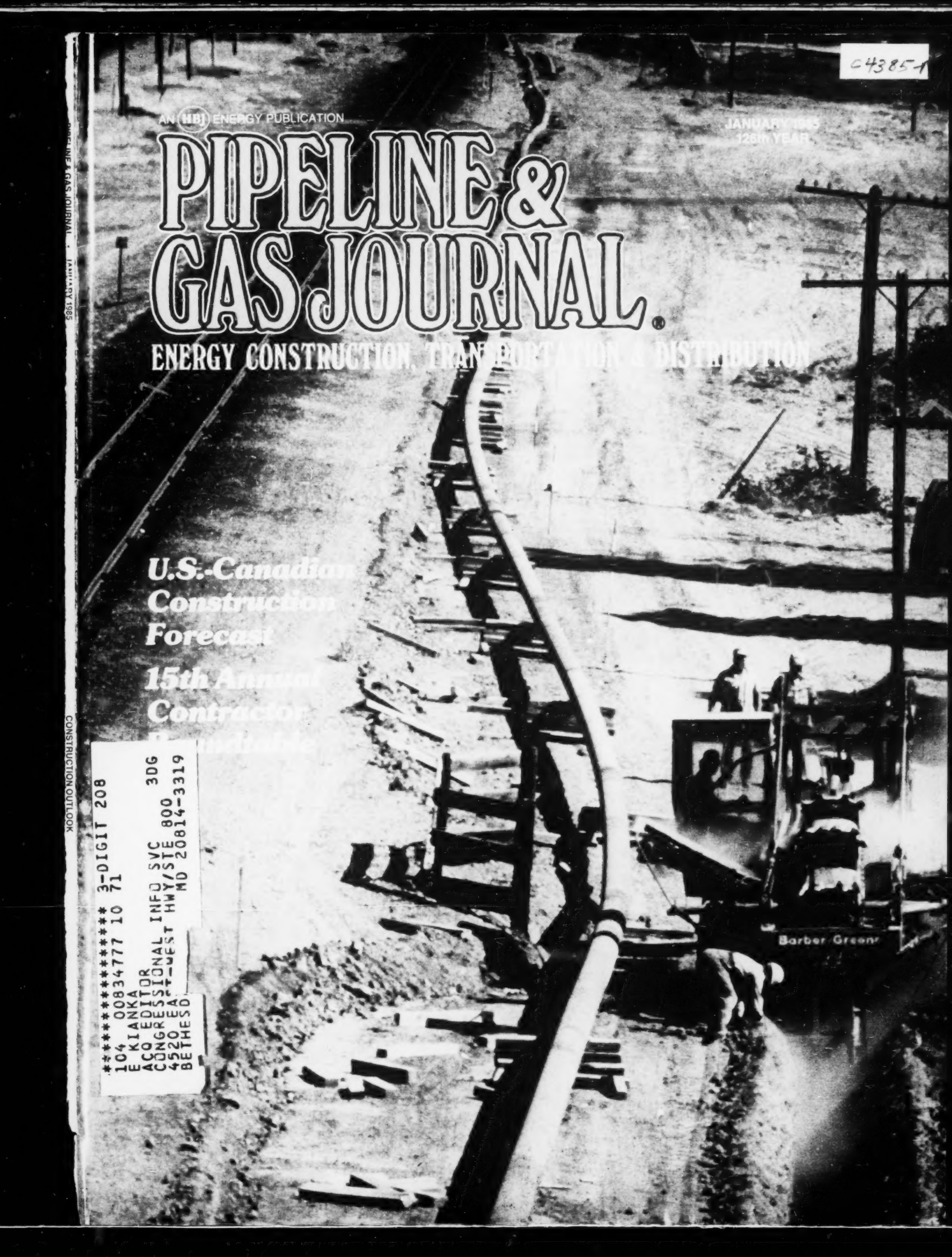

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CONSTRUCTION OUTLOOK

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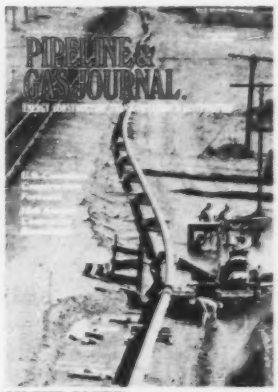
International Pipeline & Gas Utility Design, Construction & Operation

Much of Southern Pacific Pipe Lines' new 145-mile, 12-in. products pipeline was installed on railroad right-of-way through California's northern San Joaquin Valley. New pipeline carries commercial aviation fuel, military jet fuel, gasoline, and diesel fuel from refineries in the San Francisco Bay area.
– Photo courtesy Southern Pacific Pipe Lines.



ON THE COVER

Gregory & Cook Inc. has completed a 218-mile, 30-in. pipeline supplying carbon dioxide used in tertiary recovery projects in West Texas. The Bravo pipeline generally crosses grasslands along the route, with hill country encountered only near the Canadian River. The colorless, odorless gas will be used to boost production in old oil fields near Denver City.

IN THIS ISSUE

Pipelines built 30, 40, and 50 years ago are reaching the point where they have to be repaired, renovated, or replaced. In February, PIPELINE & GAS JOURNAL will focus on this vital segment of the energy transportation industry and its ever-growing share of the capital budget. Around the world, expenditures on the 3Rs will total $5 billion in 1985.

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U.S. and Canada pipeline construction activity in 1985 will continue to focus on shorter main lines, laterals, and loops of existing systems, bolstered by some big projects.

14 Contractors Must Be Efficient
To get the pulse of the ever-changing pipeline construction industry, PIPELINE & GAS JOURNAL gathered together six top executives and asked them some tough questions.

20 International Contractors Roundtable
Participants in this year's International Contractors roundtable say working around the world is becoming more and more difficult, due to tough competition and limited work.

24 Products Line Completed
Southern Pacific Pipe Lines' new 145-mile, 12-in. products line links refineries in the San Francisco Bay area to markets in and around Fresno.

26 Bravo Pipeline System
Completed under budget and ahead of schedule, the Bravo pipeline is the third major pipeline supplying carbon dioxide for enhanced oil recovery projects in West Texas.

28 How To Get Quality
Technical appraisal of gas pipeline standards and codes adopted by six countries – U.K., U.S., West Germany, Netherlands, Canada, and France – show differences in each.

35 Compression Facilities Upgraded
Cabot modernized compression facilities at its Walton Plant, replacing 31 aging units with three new compressors on a lease plan. Sharply reduced operating costs were achieved.

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Crude Oil, Natural Gas Lines Dominate 1985 Outlook

Pipeline Construction Forecast

SPECIAL REPORT

by Dean Hale,
Editor

More than 37,159 miles of cross-country pipelines are underway, planned, or projected in the U.S. and Canada as of January 1, 1985.

During the next 12 months, the industry expects to complete 10,232 miles of cross-country pipelines in the U.S. and Canada at an estimated cost of $3.26 billion.

Construction activity in 1985 will continue to focus principally on shorter main lines, laterals, loops of existing systems, plus expansion of oil and gas gathering systems. That activity will be bolstered by the construction of several completely new pipeline systems, some of them "big" projects.

Changes in demand – and continuing lower demand – for hydrocarbon energy, along with reduced drilling, exploration, and developmental activity in the past two years have had a marked effect on pipeline construction plans. The result has been a pattern of major changes in energy supply and demand, with an increased need for a means to move crude oil from the West Coast to the Gulf Coast and Midwest refining areas, lessened need for Gulf Coast to Midwest oil pipelines (witness the abandonment of the Texoma and Seaway oil pipelines), and conversion of oil lines to gas service and gas lines to products service (Transgulf). Industry observers say many other conversions will occur in the next 10 years.

"Changes in demand, and continuing lower demand ...in the past 2 years have had a marked effect on pipeline construction plans."

Planned, proposed, and underway pipeline projects in the U.S. and Canada totalled 37,159 miles as of January 1, 1985. Total includes 26,962 miles in the U.S. and 10,197 in Canada.

For 1985, according to PIPELINE & GAS JOURNAL's annual survey of U.S. pipeline construction, U.S. pipeline work completed will include 2,121 miles of natural gas lines; 1,012 miles of crude oil lines; 333 miles of products pipelines; 95 miles of slurry lines; and 5,270 miles of oil and gas gathering lines. In Canada, a total 1,330 miles of all types lines will be built.

Gas Pipelines. Natural Gas Pipeline Co. of America will continue to install replacement pipeline on its western Amarillo pipeline system–233 miles of 36- and 42-in. loops in Iowa and 81 miles of 36-in. in Texas – replacing existing 24-in. lines. NGPLA also plans to build its 185-mile, 24-in. "Texas Crossover" line that will link its western and eastern systems with a line across northern Texas.

Midcon Corp., NGPLA's parent, plans to spend $273 million in 1985 on capital expenditures for pipeline replacement and expansion.

Northern Natural Gas Co. plans a 61-mile system extension in Minnesota and South Dakota to serve new industrial, commercial, and residential customers.

American Natural Resources' ANR Pipeline plans to install 62 miles of 42-in. and 121 miles of 36-in. loops on its system in Illinois and Indiana.

Florida Gas Transmission, as part of the program to completely loop its 30-in. system, will install 309 miles of 30-in. plus another 52 miles of 20- and 24-in. laterals. Installation of the lines will release the existing 24-in. line, which has been purchased by Transgulf Pipeline Co. for conversion to products pipeline service.

Transco plans to install 63 miles of 24-, 30-, and 36-in. loops on its system to increase capacity.

Arkla Inc. has two major projects for 1985 – one involving 148 miles of 16-in. replacement in western Oklahoma and the Texas Panhandle, the other a $102-million project involving 136 miles of 30-in. from Gurdon, Ark., to Monroe, La., that will permit sales of gas to Southern Natural.

Mantaray Pipeline Co. expects to build its 24- and 36-in. system off the South Texas Coast in 1985; line will connect reserves off Matagorda Island to onshore lines of Trunkline Gas and Texas Eastern.

Proposals by various combinations of gas transmission companies to transport increasing quantities of Canadian gas exports to Northeastern U.S. markets have been "bundled" into one giant hearing by the Federal Energy Regulatory Commission. Included are the Boundary Project plus competing plans by Northern Border Pipeline, ANR Pipeline, Great Lakes Gas Transmission, and Natural Gas Pipeline Co. of America. FERC said the proposed projects are "partially or potentially competitive (and)... should all be considered in relations to each other... before the same presiding administrative law judge."

Northern Border (InterNorth) and ANR has proposed a $1.2-billion, 845-mile system from Ventura, Iowa to Leidy, Pa. Great Lakes would build 350 miles of 36-in. loops and replace part of the ANR-NBPL proposal from Ventura to near Chicago. NGPLA has also proposed a Ventura-Illinois shortcut.

Conversion of the 457-mile, 30-in. former Texoma crude oil pipeline is underway by Houston Natural Gas, NGPLA, and Transok Pipeline. Eventually, HNG will operate 272 miles in Texas, Transok will operate 146 miles in Oklahoma, and NGPLA will operate a 39-mile midway "buffer between the two. The entire system will be operated as a contract carrier."

Seaway Pipeline, a 510-mile, 30-in. crude line acquired totally by Phillips Petroleum Co., has FERC okay to convert the northern 153 miles (in Oklahoma) to gas service. Remainder of the line is expected to be converted later in 1985.

"Construction activity in 1985 will continue to focus primarily on shorter main lines, loops...plus expansion of oil and gas gathering systems."

Crude Oil Pipelines. All-American Pipeline Co., a unit of Celeron Corp., will begin full-scale construction on its 1,600-mile, 30-in. line from Bakersfield, Calif., to Freeport, Tex., in early 1985. Work on a major river crossing in Arizona was begun in December.

Pacific Texas Pipeline Co., which plans a 1,026-mile, 42-in. from near Long Beach to the Midland, Tex.-area, has named Williams Brothers Engineering Co. as project engineer and Morrison-Knudsen Co. as construction manager. No date for construction has been announced.

Department of Energy's Strategic Petroleum Reserves project, with two less major outlets available for its stored crude stocks (the now abandoned Texoma and Seaway Pipelines to Tulsa and Cushing,

TWENTY MAJOR PROJECTS IN 1985

Type	Company	Miles	Size	Location
Oil	All-American Pipeline	1,600	30	Bakersfield, Calif., to Freeport, Tex.
Gas	ANR Pipeline Co.	183	36, 42	Loops in Illinois and Indiana
Gas	Arkla, Inc.	148	16	Replacement lines in Oklahoma and Texas
Gas	Arkla, Inc.	135	30	Arkansas and Louisiana
CO_2	Central Basin Pipeline	135	16, 20, 24	West Texas
Slurry	Chevron Chemical Co.	95	10	Vernal, Utah to Rock Springs, Wyo. (Phospate)
CO_2	Chevron U.S.A.	180	16	Rangely, Colo. to LaBarge, Wyo.
Oil	Dept. of Energy	77	30, 36	Texas Gulf Coast tie-in lines
Gas	Florida Gas Transmission	361	26, 30	Loops on system
Gas	Mantaray Pipeline Co.	105	24, 36	Offshore Texas
Gas	Natural Gas PL Co. of Am.	314	30, 36, 42	Loops in Iowa and Texas
Gas	Natural Gas PL Co. of Am.	185	24	Texas Crossover line
Gas	Panhandle Eastern PL Co.	447	Var.	Loops, extension in Colo., Okla., Kan., Tex., Wyo.
Gas	Seaway Pipeline (Phillips)	150	30	Conversion, oil to gas
CO_2	Shell Oil	161	16, 20	Miss. area to Weeks Island, La.
Prod.	Southern Pacific PL Co.	153	16, 20, 24	Loops on lines in Calif. and Ariz.
Gas	Texoma Pipeline	457	30	Conversion, crude to gas
Prod.	Transgulf	890	24	Conversion, gas to products
Prod.	Transgulf	80	16, 20, 24	New delivery laterals

1985 PIPELINE OUTLOOK

Miles Planned Or Proposed

Type Of Line	U.S.	Canada
Natural Gas	10,129	8,098
Crude Oil	3,647	520
Products	1,431	594
Slurry	9,568	635
Carbon Dioxide	2,187	350
TOTALS	26,962	10,197

Projected Completion, Miles

Type Of Line	U.S.	Canada
Natural Gas	2,121	
Crude Oil	1,012	
Products	333	
Carbon Dioxide	366	
Slurry	95	
Oil/Gas Gathering	5,270	
TOTALS	8,902	1,330*

*No Breakdown Is Available

Okla.), is planning 77 miles of tie-in pipelines for its storage domes in South Texas.

Southern California Pipeline System (a joint venture of Chevron, Shell, and ARCO's Four Corners Pipeline System) has announced plans for, and the route of most of, its 260-mile, 30-in. system to take heavy crude from the Santa Barbara offshore fields for delivery to Los Angeles area refineries.

Continental Pipeline Co. will build 11.5 miles of 14-in. pipeline on the North Slope of Alaska to connect the Milne Point field to the Kuparuk Pipeline, operated by ARCO Pipeline.

Celeron Pipeline has announced plans of its own for a 130-mile, 30- in. crude line from the Santa Barbara area to transport heavy oil from offshore fields to Bakersfield. Crude would probably be delivered to Celeron's All-American Pipeline going east out of Bakersfield.

Products Pipelines. Southern Pacific Pipe Lines Co. plans to build 153 miles of 16-, 20-, and 24-in. loops on its pipelines in California and Arizona.

Transgulf Pipeline Co. will begin conversion of the 890-mile, 24-in. gas pipeline acquired from Florida Gas Transmission and build 80 miles 16-, 20-, and 24-in. laterals to create a 970-mile products system between Baton Rouge, La., and Fort Lauderdale, Fla.

Other major products line projects still being planned include 130 miles in Texas by Texas Eastman and an 820-mile, 10-in. system from Williston, S.D., to Conway, Kan., by Phillips.

Slurry Pipe Lines. Only major slurry pipeline project planned in 1985 is the 95-mile, 10-in. phosphate slurry pipeline for Chevron Chemical Co. between Vernal, Utah and Rock Springs, Wyo.

The much-heralded Energy Transportation Systems Inc. coal slurry pipeline from Wyoming to Texas was killed in 1984 by its final owners. It is not expected to be revived in the same form.

Numerous other coal slurry pipelines, some involving combinations of carbon dioxide and coal or methanol and coal, remain in the planning stages.

Carbon Dioxide Pipelines. Chevron U.S.A. will build a 180-mile, 16-in. line from Rangely, Colo., to LaBarge, Wyo., to begin a major enhanced oil recovery project using carbon dioxide.

The Central Basin Carbon Dioxide Pipeline, planned by Northern Natural Resources Co., will involve 135 miles of carbon dioxide lines in West Texas – 85 miles of 16-in.; 30 miles of 24-in.; and 20 miles of 20-in.

Frio Pipeline Co. has announced plans for 116 miles of carbon dioxide line in West Texas, while C.S. Industries is planning 32 miles of 6-in. in the same area. Big Three Industries is also planning a 70-mile carbon dioxide West Texas system.

Shell Oil is planning 161 miles of 16- and 20-in. carbon dioxide line from Mississippi sources to Weeks Island, La.

Canadian Pipeline Projects. B.C. Hydro plans 46 miles of 24- in. and 170 miles of 8- to 20-in. laterals in Vancouver area. Inland Natural Gas Co. plans 180 miles of transmission line to serve Vancouver Island plus 1,500 miles of distribution lines.

Amoco Ltd. plans 500 miles of 12-in. products line from Sarnia to Quebec City. Esso Resources Ltd. is planning 1,200 miles of crude oil line from the Beaufort Sea area to northern Alberta.

Chevron Ltd. has 120 miles of 3- to 12-in. underway in British Columbia.

TransCanada PipeLines plans 277 miles of 36-, 42-, and 48-in. loops on its system to deliver increased natural gas exports for U.S. markets.

Polar Gas System, in its latest revision, now plans a 1,333-mile, 36-in. pipeline from the High Arctic region and the Mackenzie Delta to northern Alberta.

The $780-million Sable Gas System Ltd., designed to take gas from offshore Sable Island region, is planned to include about 204 miles of 30-in. and 380 miles of 24-in. Gas would be delivered in Newfoundland and to the U.S. Northeast.

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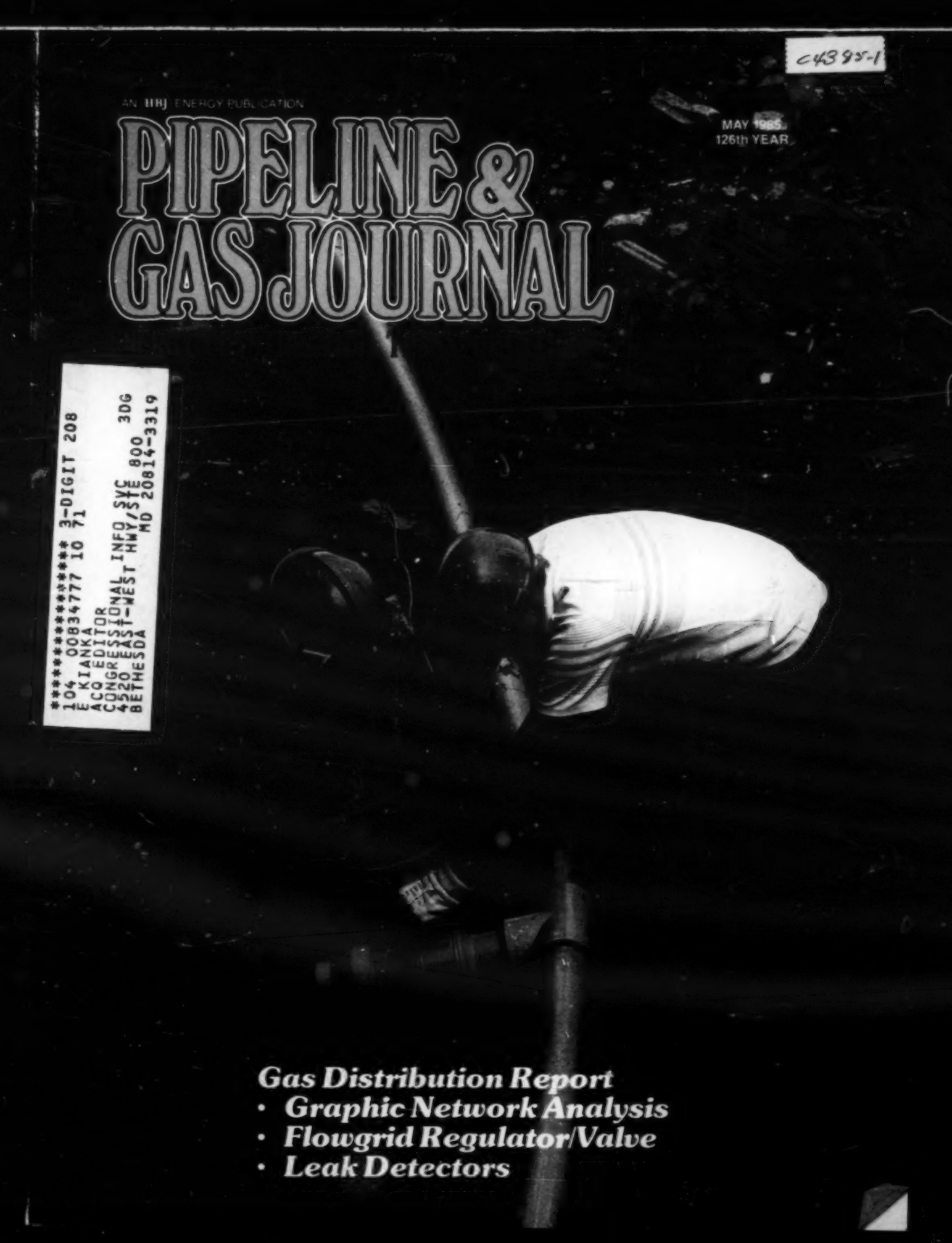

Gas Distribution Report

- Graphic Network Analysis
- Flowgrid Regulator/Valve
- Leak Detectors

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International Pipeline & Gas Utility Design, Construction & Operation

One of the most important advances in gas distribution over the last 20 years has been the introduction of plastic pipe into the marketplace. Here a crew from National Fuel Gas Corp. taps into a plastic line as part of a project to serve new home construction.

ON THE COVER

Gas is the premium fuel for many applications – including putting the fire into a movie star dragon. Feeding the dragon was causing woes at Universal Studios, until Southern California Gas stepped in and solved the problem.

IN THIS ISSUE

Pipelines are the safest, most efficient way to move liquid energy from the wellhead to the consumer. In the June issue the focus will be on changes coming in the marketplace. Articles will include an outlook for petroleum pipelines by Keith Bailey, chairman of Williams Pipe Line Co., and details of the All-American Pipeline project.

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By mid-1985, Swedish homes and factories will be receiving natural gas from Danish fields through a new pipeline system.

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Southern California Gas serves 4 million regular customers and one dragon. Today, even dragons can earn a better living with natural gas.

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Natural Gas Can Play Role In Developing Needed Continental Energy Policy

ENERGY ECONOMICS

by Dale W. Steffes,
Principal, Planning and Forecasting Consultants, Houston, Texas

In March 1985 President Reagan and Prime Minister Brian Mulroney met in Quebec City to open talks on a long-term bilateral trade and friendship policy between the U.S. and Canada. President Reagan is in his second and final term as the U.S. leader. Mulroney is just beginning his tenure as Canada's prime minister. From reading Mulroney's political philosophy as it came out in the recent campaign, it appears that Canada and the U.S. can compromise on several mutually beneficial issues. One could be a unified North American energy policy.

While Canada and the U.S. would be the likely benefactors, a true North American energy policy would include Mexico. The leadership of all three countries could be involved in developing a continental energy policy.

While this article is meant to mainly address energy policy, it must be considered in the bigger picture. There are many forces other than energy that must be addressed. These influences – social, technological, political, economic, ecological, and geographical – all impact each other, directly and indirectly.

The U.S. dominates the region in population, gross national product, and trade. In area, the Lower 48 plus Alaska equals Canada, but the continental U.S. lies in a more conducive climate. Certainly the U.S. is the most highly industrialized. Table 1 gives details on the general characteristics, population, area, GNP, GNP per capita, energy per capita, and trade of the three.

Mutual benefits. What could be gained by mutual cooperation between these three geographically connected nations? Each has something it could provide to the others without undue hardship. The trick will be to establish development that will make all parties better off by trading and working together. This is called "the law of comparative advantage" in economics, where every nation provides what it is best at producing.

Because of the relative geographical positions of the three countries in relation to each other, it makes sense to develop mutual relationships. It also would make sense to develop a common market, a common defense, a common money, a common aid agreement, and even some type of common government. All of this could be done while simultaneously protecting the political and social sovereignty of each country.

One place to begin implementing this set of common relationships would be a continental energy policy. Both Mexico and Canada are richly endowed with energy, just as the U.S. once was. The U.S. consumed much of its easy energy supply while developing into one of the world industrial powers. There could be considerable synergism if the U.S. could assist Canada and Mexico in developing their natural resources, using U.S. industrial and financial strengths. From Mexico's and Canada's parochial energy view, they could say that they do not need the U.S. industrial might. They are probably correct.

But if the U.S. is forced to develop a non-traditional energy economy, then when Mexico and Canada want to capitalize on their natural resource base, the U.S. would not be a market. We believe the energy economy eventually will transcend to a much higher level, as the industrialized world moves toward an information age.

Energy shift. It would be better for the continent to move slowly to a non-traditional energy economy by first consuming the available conventional resources. When the world physically depletes its conventional energy, energy prices will be high enough to justify new fuel technology, yet require less than 15% of our total GNP.

Energy abundance. The North American continent is well endowed with conventional energies – petroleum, natural gas, coal, hydroelectric, and uranium. Table 2 details reserves and cites energy consumption and production. It uses quadrillion Btus for comparison (one quad = $1 \times 10^{(15)}$). The continent is very

TABLE 1
Basic Continental Relationships

	U.S.A.	Mexico	Canada
Population, millions	231.5	73.1	24.6
Area, (000) Km^2	9,363	1,973	90,976
GNP, Billions, U.S.$ (1982)	3,009	171	289
GNP/Capita U.S.$ (1982)	13,161	2,270	11,140
Energy per Capita			
(000) Kg of oil equivalent	7,540	740	9,208
Total World Merchandise Trade (1982), U.S.$ (millions)			
Imports	254,884	55,091	15,042
Exports	212,255	68,499	21,006

Source: World Bank

TABLE 2
North American Continental Energy
(Quadrillion Btu)

Country	Crude Oil	Natural Gas	Nat. Gas. Liquids	Coal	Hydro	Uranium	Total
		RESERVES					
U.S.	162	201		5300			
Mexico & Canada	220	173		150			
		PRODUCTION (1985)					
U.S.	17	18	2	18	3	4	= 62
Mexico & Canada	9	4	1	1	4	1	= 19
							81
		CONSUMPTION (1985)					
U.S.	.....	(Total)	.....	70	.....		70
Mexico & Canada	.....	(Total)	.....	12	.....		12
							82

Source: P&FC World Energy Outlook '85

Gas pipeline under construction in Western Canada.

close to being self-sufficient. The U.S. will consume 70 quads and produce 62 quads in 1985. Mexico and Canada will consume 12 quads and produce 19 quads. The totals are about equal.

From data in Table 2, it is evident that Mexico and Canada will be able to continue exporting energy for many years. Canada will export hydroelectric power to the eastern U.S. Mexico will continue to export crude oil to the U.S. and other countries. Mexico and Canada also have more than a 40-year supply of natural gas. They have done only modest gas exploration so far.

Pipeline system. It appears that a continental gas pipeline system and policy would make sense. It would connect Western Canadian and Arctic gas with eastern Canada and U.S. industrial markets as well as West Coast markets. Eastern Canada offshore gas will need to be connected to eastern U.S. markets. The other logical continental pipeline connections would be through Central America, tying to the pipeline network in South Texas. This system, discussed for more than two decades, would extend into South America. Such grandiose pipeline plans will not develop without the markets and strength of the industrialized nation – the U.S.

The most prominent trade-off will be economic. Is the market reliable? Will any of the parties default on their part of the agreement? Will natural gas trade make inter-country trade more balanced or will it distort it further? Will the flow of construction dollars be fairly divided? Current U.S./Canada merchandise trade favors Canada by $12 billion. The U.S. imports $63 billion of Canadian goods per year and Canada imports $51 billion of goods from the U.S.

Mexico-U.S. trade is different. Mexico is burdened with a monumental debt of nearly $100 billion, much owed to the private U.S. banking system. Most of this debt was incurred in anticipation of ever-increasing oil production and expected oil price increases. But prices and demand dropped, causing a real shock to the bankers and the energy industry.

Pipeline benefits. The building of these gas pipelines would create needed employment in all three countries. After they are built, the required exploration and production would cause employment to continue into the future. If these energy developments should take place, it would stimulate a better economic climate in each country.

The technology of oil and gas exploration and production is well developed for both the arctic and the tropics, onshore and offshore. Pipelining of hydrocarbons in severe environments is technically feasible. But costs must be reduced. Cost is the main reason why the Alaska gas pipeline was not built.

Much of the high cost of pipelines today is due to self-imposed environmental requirements. Arctic natural gas pipelines could be installed for less than half previous estimates if a little reason were applied. Ecologically, today's big issue is acid rain. It affects the continental energy policy. U.S. and Canadian leaders have agreed to high level discussions to address this problem.

All must benefit. A fair and equitable continental energy policy can be devised so that all parties would benefit by participating on a long term basis. It must be designed to accommodate external changes in world energy, such as demand and supply, because they will change very often over the rest of this century.

Investment in fixed facilities with a pipeline system should probably incorporate both private and public capital. Canada's National Energy Board and Mexico's Pemex must be involved.

While a continental energy policy and plan will be difficult to accomplish, it makes sense. To accomplish it, an *ad hoc* working committee could be formed to include U.S., Canadian, and Mexican counterparts. These groups would hold conferences and dialogues to build a body of agreements and to discuss disagreements that need to be overcome. A working committee would include one representative from each country for each of seven prime influences – 21 delegates.

A continental energy plan could become the basis for a unified or overall trade and economic plan for the North American continent. **P&GJ**